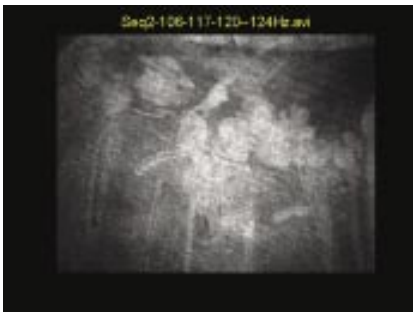
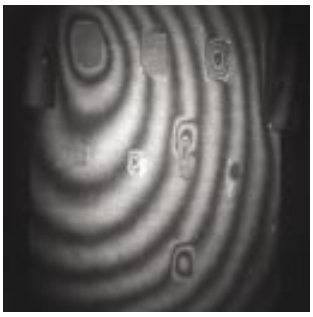
Non-destructive testing

- Casting defects
- Welding or brazing defects
- Crack detection (internal or emergent)
- Damage (delamination) in composite materials
- Material heterogeneity
- Adhesion defects:
  - absence of adhesive
  - defect in adhesive
  - craks in adhesive
- On-line testing
- Electronics: defects in components attachment.





INTERFEROMETRIC TECHNIQUES

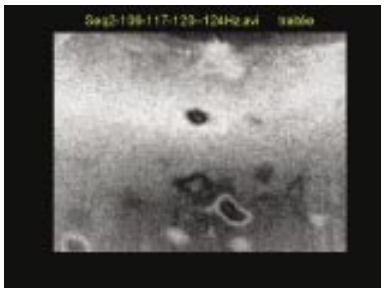
The principle

Interferometric techniques allow tiny deformations of the surface of a part to be viewed and measured (resolution to a fraction of a micrometer).

Using these methods for Non-Destructive Testing involves stressing the part. An internal defect is revealed by a surface deformation detected using an interferometric setup.

Several stressing methods enable the chosen method to be adapted to the type of defect to be detected and to the type of material :

- Quasi-static stressing:
  - Static mechanic stress
  - Depressurisation
  - Thermal stress
- Dynamic stressing:
  - Shock
  - Vibration



Plaster debonding detection of wallpaintings. Cultural heritage application.

Viewing in real-time

The interferometric procedure used enables a network of fringes to appear on the surface when stress is applied, and this highlights any defects.

Artificial faults on an elastomer test specimen - SEP division of SNECMA

Static mechanical stress

The part is located in a support which allows adjustable stress to be applied. A reference image is recorded. When stress is applied, the deformation of the part can be viewed on a screen in real time. Cracks or defect is shown as an anomaly in the network of fringes observed at the location of the defect (slope discontinuity, fringe accumulation).

Thermal stressing

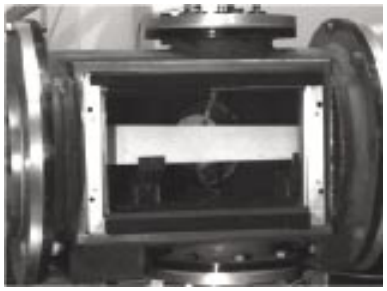
This is applied to sandwich-type structures consisting of several types of materials with different expansion coefficients. A reference image of a part previously heated by several degrees is recorded. When the part is cooled, any faults are easily detected by viewing the deformation of the part in real time.
Pulsed-laser NDT

The principle

Certain types of stressing (vibration, shock) and on-site measuring conditions prohibit real-time testing. A pulsed laser enables a structure to be 'frozen' in the best possible conditions so that defects can be revealed.

Depressurisation

The part is placed in a depressurisation chamber fitted with a viewing port.
A reference view of the object at a given pressure is recorded. The deformation of the part in real time can be observed by applying slight depressurisation. A defect will appear in the form of concentric fringes (surface deformation of the part). This technique is especially useful for detecting adhesion faults in composites.



Depressurisation chamber

Shock

This method is well suited to in situ tests as it is easy to use. A low-amplitude shock is applied to the part, and this generates a vibration of it. A double exposure enables the particular modes of vibration due to the presence of faults to be viewed. Faults are easily detected in composite materials by using this technique.

Vibration

The method consists of comparing one or more modes characteristic of a reference part (part without faults) with those of a part for testing. The presence of defects due to manufacture or wear modifies the rate of the modes. In certain cases interpretation can proceed immediately without a reference part.

Non-destructive testing of foam adhesive on metal (liquid air)

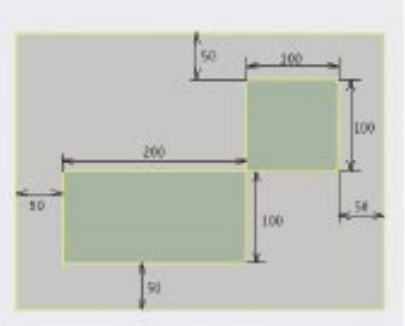
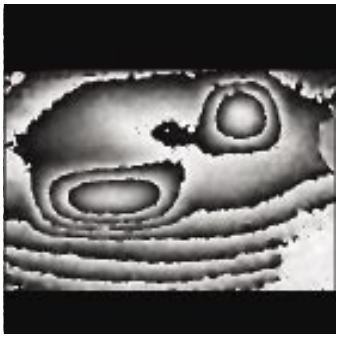


Diagram of the part with sites of artificial defects



Defect detection.

EQUIPMENT

Technical features

- Viewing defects in real time or with a slight delay
- Non-contact full field approach
- Maximum surface analysed:
  - 0.2 x 0.4 m (depressurisation)
  - 1 m^2 (static, thermal stress)
  - 10 m^2 (pulsed laser)
- Measurement on an anti-vibration bench or on site (pulsed laser)
- Spatial resolution: image 512 x 512 or 1024 x 1024 pixels
- Results displayed on a PC

Références

AEROSPATIALE, CEA, DASSAULT, ECIA, EDF, FRAMATOME, ONERA, PSA, RENAULT, SCHLUMBERGER, SNECMA

Holo3

7 rue du Général Cassagnou F-68300 Saint-Louis T : +33 (0)3 89 69 82 08
F : +33 (0)3 89 67 74 06 info@holo3.com http://www.holo3.com